# EXHIBIT AH

MOLDEX
The Mold Experts
Licensed Contractor ROC 187342
moldex@qwest.net 602 370-2166

## Project Location

**Mesa, AZ**

**Note: Visual inspection project indicates the presence of moisture damage in the upstairs right side bathroom sink cabinet. I would suspect that because the moisture intrusions due to a leak in the sink drain line located inside the wall.**

## Project Descriptions

### Swab Surface – Right Side Bathroom Sink Cabinet

**A swab surface sample of suspected mold contamination was taken from the dark substance located at the base of the moisture damaged lower right side panel, on April 12, 2019.**

**Approximately 1 $cm^2$ of suspected contamination was collected on the tip of a factory sealed sterile swab, which was then submitted to an American Industrial Hygiene Association Accredited Mycology Laboratory for analysis and publication of the included copy of the actual test results.**

**The final conclusion may not be based upon the test results alone; but rather the weighing of all applicable factors.**

**These factors include any pertinent client provided personal information, discoveries at the time of the visual inspection, any pertinent extenuating factors, as well as the input and experience from the Allergists, Toxicologists & Immunologists that we have worked with in the past, including the threshold and tolerances as prescribed by our consulting Professor of Microbiology who holds a PhD in Microbiology, and taught at Arizona State University for over 32 years.**

**As indicated by the Swab Sample Test Analysis, the project has Failed to Pass the test criteria due to an Abnormal Level of the Mold Variety "Aspergillus", as well as the Abnormal Presence of Mold Hyphae (Mold Vegetation) being found in the test sample that was submitted.**

**Indoor Air Test Series**

**Random air samples were taken from the indoor (upper staircase landing) and outdoor atmospheres on April 12, 2019.**

**These samples were acquired by the utilization of a computer controlled air test system, manufactured by A.P. Buck Inc., with system calibration set to the industry standard of 15 liters of air per minute, for a sampling duration of 5 minutes, and for a total draw volume of 75 liters.**

**The test sampling media was either an Air-O-Cell or an Allergenco D air sampling cassette that was factory sealed, sterile, and used within the manufacturer stated expiry date.**

**These samples were then submitted to an American Industrial Hygiene Association Accredited Environmental Microbiology Laboratory for analysis, with the test results being published in the form of an Excel spread sheet.**

**Determination as to whether or not these results contain an abnormal level of mold contamination is based upon a common sense.**

**Simplistically speaking... the air inside the structure came from the outdoors, but unlike the outdoor air, the indoor air is being filtered prior to passing through the air handler(s).**

**Therefore, common sense dictates that the indoor air test results should contain fewer (if any) mold contaminants than was found in the outdoors, and if Mold spores are found, the varieties should be predominantly consistent with those of the outdoors.**

**The final conclusion is never based solely upon these results, but rather, they are a weighing of all applicable factors.**

**These factors include any pertinent personal information provided by the client, discoveries at the time of the visual inspection, any pertinent extenuating factors, input and experience from the Toxicologists & Immunologists that we have worked with in the past, including the threshold and tolerances as prescribed by our consulting Professor of Microbiology who holds a PhD in Microbiology, and taught at Arizona State University for over 32 years.**

**At this time, and as indicated by the Air Test Analysis, the Indoor Air Test Result has Failed to Pass the Test Criteria due to an Abnormal Level of the Mold Variety "Aspergillus" being found in the test sample that was submitted.**

**Conclusion**

**A Mold Remediation of the affected Right Side Bathroom Sink Cabinet and Cabinet Back Wall is Highly Recommended.**

**Thank You for choosing Moldex.**

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Expertise Since 1997

**Certificate of Analysis**

2208 West Northern Ave
Suite B110
Phoenix, Arizona 85021
(602) 441-3700
www.aerobiology.net

Moldex
6808 E Beverly Ln.
Scottsdale, Arizona 85254
Attn: Daryl Choby
Project: **1718**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 04/12/2019
Date Received: 04/15/2019
Date Analyzed: 04/15/2019
Date Reported: 04/15/2019
Project ID: 19014440


1049 Quantitative Direct Exam

| Client Sample Number | 1718BSCR | | | |
|---|---|---|---|---|
| Sample Location | Right Bathroom Cabinet | | | |
| Sample Type | Swab | | | |
| Area | 1 cm² | | | |
| Lab Sample Number | 19014440-003 | | | |
| **Spore Identification** | Raw Ct | Calculated count/cm² | Sensitivity count/cm² | % total |
| Alternaria | - | - | - | - |
| ascospores | - | - | - | - |
| Aureobasidium | - | - | - | - |
| basidiospores | - | - | - | - |
| Cercospora | - | - | - | - |
| Chaetomium | 2 | 390 | 200 | <1 |
| Cladosporium | - | - | - | - |
| colorless | - | - | - | - |
| Curvularia | - | - | - | - |
| Drechslera/Bipolaris Group | 1 | 200 | 200 | <1 |
| Epicoccum | - | - | - | - |
| hyphal elements | 34 | 6,700 | 200 | <1 |
| Penicillium/Aspergillus Group | 19 | 2,000,000 | 9,800 | 100 |
| Pithomyces | - | - | - | - |
| Pyricularia | - | - | - | - |
| rusts | - | - | - | - |
| smuts, Periconia, myxomycetes | - | - | - | - |
| Stachybotrys | - | - | - | - |
| Torula | - | - | - | - |
| Ulocladium | - | - | - | - |
| unknown | 1 | 200 | 200 | <1 |
| | Debris Rating **4** | | | |
| Comments | | | | |
| **Totals** | **57** | **2,007,490** | **-** | **~100** |

TESTED POSITIVE

Revised 05/2015 v2.1

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Project: **1718**
Condition of Sample(s) Upon Receipt: Acceptable

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Date Received: 04/15/2019
Date Analyzed: 04/15/2019
Date Reported: 04/15/2019
Project ID: 19014440


## Footnotes and Additional Report Information

### Debris Rating Table

| | | |
|---|---|---|
| 1 | Minimal (<5%) particulate presence | Reported values are minimally affected by particulate load. |
| 2 | 5% to 25% of the trace occluded with particulate | Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded. |
| 3 | 26% to 75% of the trace occluded with particulate | Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded. |
| 4 | 75% to 90% of the trace occluded with particulate | Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded. |
| 5 | Greater than 90% of the trace occluded with particulate | Quantification not possible due to large negative bias. A new sample should be collected with measures taken to reduce particulate load. |

1. Penicillium/Aspergillus group spores are characterized by their small size, round to ovoid shape, being unicellular, and usually colorless to lightly pigmented. There are numerous genera of fungi whose spore morphology is similar to that of the Penicillium/Aspergillus type. Two common examples would be Paecilomyces and Acremonium. Although the majority of spores placed in this group are Penicillium, Aspergillus, or a combination of both. Keep in mind that these are not the only two possibilities.

2. Ascospores are sexually produced fungal spores formed within an ascus. An ascus is a sac-like structure designed to discharge the ascospores into the environment, e.g. Ascobolus.

3. Basidiospores are typically blown indoors from outdoors and rarely have an indoor source. However, in certain situations a high basidiospore count indoors may be indicative of a wood decay problem or wet soil.

4. The Smut, Periconia, Myxomycete group is composed of three different groups whose spores have similar morphologies. Smuts are plant pathogens, Periconia is a relatively uncommon mold indoors, and Myxomycetes are not fungi but slime molds. Although these organisms do not typically proliferate indoors, their spores are potentially allergenic.

5. The colorless group contains colorless spores which were unidentifiable to a specific genus. Examples of this group include Acremonium, Aphanocladium, Beauveria, Chrysosporium, Engyodontium microconidia, yeast, some arthrospores, as well as many others.

6. Hyphae are the vegetative mode of fungi. Hyphal elements are fragments of individual Hyphae. They can break apart and become airborne much like spores and are potentially allergenic. A mass of hyphal elements is termed the mycelium. Hyphae in high concentration may be indicative of colonization.

7. Due to rounding totals may not equal 100%.

8. The analytical sensitivity is the smallest concentration of spores that can be reliably measured and is equal to (1 spore/# fields observed)(sample area/microscopic field area)(1/unit volume)(dilution factor)

9. A dash (-) indicates a result less than the analytical sensitivity.

10. The results in this report are related to this project and these samples only.

Suzanne S. Blevins, B.S., SM (ASCP)
Laboratory Director

Revised 05/2015 v2.1

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Scottsdale, Arizona 85254
Attn: Daryl Choby
Project: **1718**
Condition of Sample(s) Upon Receipt: Acceptable

Date Collected: 04/12/2019
Date Received: 04/15/2019
Date Analyzed: 04/15/2019
Date Reported: 04/15/2019
Project ID: 19014440


1054 Spore Trap Analysis: SOP 3.8

| Client Sample Number | **1718OS** | | | | **1718IS** | | | |
|---|---|---|---|---|---|---|---|---|
| Sample Location | **Outdoor Air** | | | | **Indoor Air** | | | |
| Sample Volume (L) | **75** | | | | **75** | | | |
| Lab Sample Number | **19014440-001** | | | | **19014440-002** | | | |
| **Spore Identification** | Raw Ct | spr/m³ | % Ttl | In/Out | Raw Ct | spr/m³ | % Ttl | In/Out |
| Alternaria | - | - | - | - | 3 | 40 | <1 | - |
| ascospores | 3 | 40 | 14 | - | 1 | 13 | <1 | - |
| Aureobasidium-like species | - | - | - | - | 6 | 80 | <1 | - |
| basidiospores | 1 | 13 | 5 | - | - | - | - | - |
| Cladosporium | 4 | 53 | 18 | - | 1 | 13 | <1 | - |
| Drechslera/Bipolaris group | - | - | - | - | 3 | 40 | <1 | - |
| Epicoccum | - | - | - | - | 1 | 13 | <1 | - |
| hyphal elements | 2 | 27 | 9 | - | 6 | 80 | <1 | - |
| Oidium | 3 | 40 | 14 | - | - | - | - | - |
| Penicillium/Aspergillus group | 3 | 40 | 14 | - | 156 | 23111 | 98 | - |
| Smuts,Periconia,Myxomycetes | 1 | 13 | 5 | - | 4 | 53 | <1 | - |
| Unknown | 5 | 67 | 23 | - | 8 | 107 | <1 | - |
| | Debris Rating **3** | | | | Debris Rating **4** | | | |
| Analytical Sensitivity | Analytical Sensitivity: **13** spr/m³ | | | | Analytical Sensitivity: **13** spr/m³ | | | |
| Comments | | | | | | | | |
| Total *See Footnotes | 22 | 293 | ~100% | - | 189 | 23551 | ~100% | - |

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## Footnotes and Additional Report Information

### Debris Rating Table

| | | |
|---|---|---|
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| 3 | 26% to 75% of the trace occluded with particulate | Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded. |
| 4 | 75% to 90% of the trace occluded with particulate | Negative bias is expected. The degree of bias increases directly with the percent of the trace that is occluded. |
| 5 | Greater than 90% of the trace occluded with particulate | Quantification not possible due to large negative bias. A new sample should be collected at a shorter time interval or other measures taken to reduce particulate load. |

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1. Penicillium/Aspergillus group spores are characterized by their small size, round to ovoid shape, being unicellular, and usually colorless to lightly pigmented. There are numerous genera of fungi whose spore morphology is similar to that of the Penicillium/Aspergillus type. Two common examples would be Paecilomyces and Acremonium. Although the majority of spores placed in this group are Penicillium, Aspergillus, or a combination of both. Keep in mind that these are not the only two possibilities.
2. Ascospores are sexually produced fungal spores formed within an ascus. An ascus is a sac-like structure designed to discharge the ascospores into the environment, e.g. Ascobolus.
3. Basidiospores are typically blown indoors from outdoors and rarely have an indoor source. However, in certain situations a high basidiospore count indoors may be indicative of a wood decay problem or wet soil.
4. The colorless group contains colorless spores which were unidentifiable to a specific genus. Examples of this group include Acremonium, Aphanocladium, Beauveria, Chrysosporium, Engyodontium microconidia, yeast, some arthrospores, as well as many others.
5. Hyphae are the vegetative mode of fungi. Hyphal elements are fragments of individual Hyphae. They can break apart and become airborne much like spores and are potentially allergenic. A mass of hyphal elements is termed the mycelium. Hyphae in high concentration may be indicative of colonization.
6. Dash (-) in this report, under raw count column means 'not detected (ND)'; otherwise 'not applicable' (NA).
7. The positive-hole correction factor is a statistical tool which calculates a probable count from the raw count, taking into consideration that multiple particles can impact on the same hole; for this reason the sum of the calculated counts may be less than the positive hole corrected total.
8. Due to rounding totals may not equal 100%.
9. Analytical Sensitivity for each spores is different for Non-viable sample when the spores are read at different percentage. Analytical Sensitivity is calculated as spr/$m^3$ divided by raw count. spr/$m^3$ = raw counts x (100/ % read) x (1000/Sample volume). If Analytical Sensitivity is 13 spr/$m^3$ at 100% read, Analytical Sensitivity at 50% read would be 27 spr/$m^3$, which is 2 times higher. Analytical Sensitivity provided on the report is based on an assumed 100% of the trace being analyzed.
10. Minimum Reporting Limits (MRL) for BULKS, DUSTS, SWABS, and WATER samples are a calculation based on the sample size and the dilution plate on which the organism was counted. Results are a compilation of counts taken from multiple dilutions and multiple medias. This means that every genus of fungi or bacteria recovered can be counted on the plate on which it is best represented.
11. If the final quantitative result is corrected for contamination based on the blank, the blank correction is stated in the sample comments section of the report.
12. The results in this report are related to this project and these samples only.
13. For samples with an air volume of < 100L, the number of significant figures in the result should be considered (2) two. For samples with air volumes between 100-999L, the number of significant figures in the result should considered (3) three. For example, a sample with a result of 55,443 spr/$m^3$ from a 75L sample using significant figures should be considered 55,000. The same result of 55,443 from a 150L sample using significant figures should be considered 55,400 spr/$m^3$.
14. If the In/Out ratio is greater than 100 times it is indicated >100/1, rather than showing the real value.

**Terminology Used in Direct Exam Reporting**

**Conidiophores are a type of modified hyphae from which spores are born. When seen on a surface sample in moderate to numerous concentrations they may be indicative of fungal growth.**

Suzanne S. Blevins, B.S., SM (ASCP)
Laboratory Director

SEEML Reference Number:
190529036

**Southeast Environmental Microbiology Laboratories**
102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
FAX: (864) 233-6589

The information and data for **Environmental Testing Group/MIT** has been checked for thoroughness and accuracy. The following reports are contained within this document:

- ☒ Surface/Bulk Report
- ☒ Spore Trap Report
- ☐ Andersen Fungal Report
- ☐ Quantitative Fungal Report

Lab Manager Review: Rafael Berrios Date: 05/29/19

Thank you for using SEEML laboratories. We strive to provide superior quality and service.

The data within this report is reliable to three significant figures. The third significant figure is technically unjustified. In this instance, the third figure is reported as an estimate to facilitate the interpretation by the customer.



Guidelines for Interpretation:
No accepted quantitative regulatory standards currently exist by which to assess the health risks related to mold and bacterial exposure. Molds and bacteria have been associated with a variety of health effects and sensitivity varies from person to person.
Several organizations, including: the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC), as well as the California Department of Health Services (CADHS), have all published guidelines for assessment and interpretation of mold resulting from water intrusion in buildings.

Interpretation of the data and information within this document is left to the company, consultant, and/or persons who conducted the fieldwork.

# Spore Trap Report

| | |
|---|---|
| | Date Sampled: 05/27/19 |
| Attn: Environmental Testing Group | Date Received: 05/29/19 |
| DBA / Mold Inspection Testing | Date Analyzed: 05/29/19 |
| 650 W. Grand Ave, Suite 302 | Date Reported: 05/29/19 |
| Elmhurst, IL 60126 | Date Revised: |
| | Project Name: Jessica Kahraman |
| | Project Address: |
| | Project City, State, ZIP: Mesa Arizona 85202 |
| | SEEML Reference # : 190529036 |

**TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7**

| Client Sample ID | 2442555 | | | 2442556 | | | 2442550 | | |
|---|---|---|---|---|---|---|---|---|---|
| Location | Outside Air | | | Downstairs Hall Bath Containment | | | Downstairs Boys Bed | | |
| Lab Sample ID | 190529036-108 | | | 190529036-109 | | | 190529036-110 | | |
| Detection Limit (spores/$m^3$) | 40 | | | 40 | | | 40 | | |
| Hyphal Fragments | | | | | | | | | |
| Pollen | | | | | | | | | |
| Spore Trap Used | M5 | | | M5 | | | M5 | | |
| | raw ct. | spores/$m^3$ | % | raw ct. | spores/$m^3$ | % | raw ct. | spores/$m^3$ | % |
| Alternaria | | | | | | | | | |
| Ascospores | 2 | 80 | 3 | | | | 1 | 40 | 3 |
| Basidiospores | 17 | 680 | 27 | 7 | 280 | 39 | 10 | 400 | 26 |
| Bipolaris/Drechslera | | | | | | | | | |
| Chaetomium | | | | | | | | | |
| Cladosporium | 8 | 320 | 13 | 1 | 40 | 6 | 4 | 160 | 11 |
| Curvularia | | | | | | | | | |
| Epicoccum | | | | | | | | | |
| Cercospora | | | | | | | | | |
| Fusarium | | | | | | | | | |
| Memnoniella | | | | | | | | | |
| Nigrospora | | | | | | | | | |
| Penicillium/Aspergillus | 37 | 1480 | 58 | 10 | 400 | 56 | 21 | 840 | 55 |
| Polythrincium | | | | | | | | | |
| Rusts | | | | | | | | | |
| Smuts/Periconia/Myxomy | | | | | | | 2 | 80 | 5 |
| Spegazzinia | | | | | | | | | |
| Stachybotrys | | | | | | | | | |
| Stemphylium | | | | | | | | | |
| Tetraploa | | | | | | | | | |
| Torula | | | | | | | | | |
| Ulocladium | | | | | | | | | |
| Colorless/Other Brown* | | | | | | | | | |
| Oidium | | | | | | | | | |
| Zygomycetes | | | | | | | | | |
| Pithomyces | | | | | | | | | |
| Background debris (1-5)** | 3 | | | 3 | | | 3 | | |
| Sample Volume(liters) | 25 | | | 25 | | | 25 | | |
| **TOTAL SPORES/$M^3$** | 64 | **2560** | | 18 | **720** | | 38 | **1520** | |

Comments/Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.

The analytical sensitivity is the spores/$m^3$ divided by the raw count, expressed in spores/$m^3$. The limit of detection is the analytical sensitivity (in spores/$m^3$) multiplied by the sample volume (in liters) divided by 1000 liters.

*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.

**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

**Disclaimer**: The sample results are determined by the sample volume, which is privided by the customer.
This report relates only to the samples tested as they were received.

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Phone: (864) 233-3770

*Rafael Berrios*

Rafael Berrios, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667

Texas Lic: LAB1016

# Spore Trap Report

| | |
|---|---|
| | Date Sampled: 05/27/19 |
| Attn: Environmental Testing Group | Date Received: 05/29/19 |
| DBA / Mold Inspection Testing | Date Analyzed: 05/29/19 |
| 650 W. Grand Ave, Suite 302 | Date Reported: 05/29/19 |
| Elmhurst, IL 60126 | Date Revised: |
| | Project Name: Jessica Kahraman |
| | Project Address: |
| | Project City, State, ZIP: Mesa Arizona 85202 |
| | SEEML Reference # : 190529036 |

**TEST METHOD: DIRECT MICROSCOPY EXAMINATION SEEML SOP 7**

| Client Sample ID | 2452551 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Location | Upstairs Bath Wall | | | | | | | | |
| Lab Sample ID | 190529036-111 | | | | | | | | |
| Detection Limit (spores/$m^3$) | 200 | | | | | | | | |
| Hyphal Fragments | | | | | | | | | |
| Pollen | | | | | | | | | |
| Spore Trap Used | M5 | | | | | | | | |
| | raw ct. | spores/$m^3$ | % | | | | | | |
| Alternaria | | | | | | | | | |
| Ascospores | 1 | 200 | <1 | | | | | | |
| Basidiospores | 6 | 1200 | 4 | | | | | | |
| Bipolaris/Drechslera | | | | | | | | | |
| Chaetomium | 2 | 400 | 1 | | | | | | |
| Cladosporium | 2 | 400 | 1 | | | | | | |
| Curvularia | | | | | | | | | |
| Epicoccum | | | | | | | | | |
| Cercospora | | | | | | | | | |
| Fusarium | | | | | | | | | |
| Memnoniella | | | | | | | | | |
| Nigrospora | | | | | | | | | |
| Penicillium/Aspergillus | 146 | 29200 | 93 | | | | | | |
| Polythrincium | | | | | | | | | |
| Rusts | | | | | | | | | |
| Smuts/Periconia/Myxomy | | | | | | | | | |
| Spegazzinia | | | | | | | | | |
| Stachybotrys | | | | | | | | | |
| Stemphylium | | | | | | | | | |
| Tetraploa | | | | | | | | | |
| Torula | | | | | | | | | |
| Ulocladium | | | | | | | | | |
| Colorless/Other Brown* | | | | | | | | | |
| Oidium | | | | | | | | | |
| Zygomycetes | | | | | | | | | |
| Pithomyces | | | | | | | | | |
| Background debris (1-5)** | 4 | | | | | | | | |
| Sample Volume(liters) | 5 | | | | | | | | |
| **TOTAL SPORES/$M^3$** | 157 | **31400** | | | | | | | |

Comments/Revisions:

Spore types listed without a count or data entry were not detected during the course of the analysis for the respective sample, indicating a raw count of <1 spore.
The analytical sensitivity is the spores/$m^3$ divided by the raw count, expressed in spores/$m^3$. The limit of detection is the analytical sensitivity (in spores/$m^3$) multiplied by the sample volume (in liters) divided by 1000 liters.
*Colorless,other Brown are spores without a distinctive morphology on spore traps and non-viable surface samples.
**Background debris is the amount of particulate matter present on the slide and is graded from 1-5 with 1 = very light, 2= Light, 3 = Medium, 4 = Heavy, 5 = Very Heavy. The higher the rating the more likelihood spores may be underestimated. A rating of 5 should be interpreted as minimal counts and may actually be higher than reported.

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This report relates only to the samples tested as they were received.

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Phone: (864) 233-3770

*Rafael Berrios*

Rafael Berrios, Approved Laboratory Signatory

AIHA-LAP, LLC EMLAP #173667

Texas Lic: LAB1016

# Surface and Bulk Sample Report

| | |
|---|---|
| | Date Sampled: 05/27/19 |
| Attn: Environmental Testing Group | Date Received: 05/29/19 |
| DBA / Mold Inspection Testing | Date Analyzed: 05/29/19 |
| 650 W. Grand Ave, Suite 302 | Date Reported: 05/29/19 |
| Elmhurst, IL 60126 | Date Revised: |
| | Project Name: Jessica Kahraman |
| | Project Address: |
| | Project City, State ZIP: Mesa, AZ 85202 |
| | SEEML Reference #: 190529036 |

**TEST METHOD: Direct Microscopic Examination (SEEML SOP 18)**

| Client Sample ID | Swab Stick #1 | | | |
|---|---|---|---|---|
| Location | Hall bath/Boys Room | | | |
| SEEML Sample ID | 190529036-112 | | | |
| Sample Type | Swab | | | |
| | Quantification* | | | |
| Hyphal Fragments | | | | |
| Pollen | | | | |
| **General Impressions **** | **NFG** | | | |
| **Fungal Spore:** | | | | |
| Alternaria | | | | |
| Acremonium | | | | |
| Ascospores | | | | |
| Basidiospores | | | | |
| Bipolaris/Drechslera | | | | |
| Cercospora | | | | |
| Chaetomium | | | | |
| Cladosporium | | | | |
| Curvularia | | | | |
| Epicoccum | | | | |
| Fusarium | | | | |
| Geotrichum sp. | | | | |
| Memnoniella | | | | |
| Myxomycetes | | | | |
| Nigrospora | | | | |
| Penicillium/Aspergillus | **Scattered Spores** | | | |
| Pithomyces | | | | |
| Rusts/Smuts | | | | |
| Stachybotrys | | | | |
| Torula | | | | |
| Ulocladium | | | | |

**** General Impressions: NFG = No Fungal Growth, FG = Fungal Growth, MFG = Minimal Fungal Growth Or Growth in vicinity**

**Quantification of fungal growth is done by semi-quantitative grading using the following ranges:**

**Scattered Spores, 1-20 fungal spores**

**VL = 21-100 fungal spores** **L = 101-1,000 fungal spores** **M = 1,001-10,000 fungal spores** **H = >10,000 fungal spores**

**ND = No Fungal Spores Detected**

Disclaimer: This report relates only to the samples tested

Respectfully submitted, SEEML

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# Fungal Descriptions

## Alternaria sp.

Aw - 0.89. Conidia dimensions: 18-83 x 7-18 microns. A very common allergen with an IgE mediated response. It is often found in carpets, textiles and on horizontal surfaces in building interiors. Often found on window frames. Outdoors it may be isolated from samples of soil, seeds and plants. It is commonly found in outdoor samples. The large spore size, 20 - 200 microns in length and 7 - 18 microns in sizes, suggests that the spores from these fungi will be deposited in the nose, mouth and upper respiratory tract. It may be related to bakers' asthma. It has been associated with hypersensitivity pneumonitis.
The species *Alternaria alternata* is capable of producing tenuazonic acid and other toxic metabolites that may be associated with disease in humans or animals. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchiospasms; chronic cases may develop pulmonary emphysema.

## Ascospore

A spore borne in a special cell called an ascus. Spores of this type are reported to be allergenic.
All ascomycetes, members of a group of fungi called Ascomycotina, have this type of spore. The minute black dots on rotting wood and leaves or the little cups on lichens are examples of ascomycetes; another is the "truffle" mushroom.

## Aspergillus/Penicillium

These are two of the most commonly found allergenic fungi in problem buildings.
*Aspergillus* comes in many varieties (species). Many of the varieties produce toxic substances. It may be associated with symptoms such as sinusitis, allergic bronchiopulmonary aspergillosis, and other allergic symptoms.
*Penicillium* is a variety of mold that is very common indoors and is found in increased numbers in problem buildings. It also has many varieties, some of which produce toxic substances. The symptoms are allergic reactions, mucous membrane irritation, headaches, vomiting, and diarrhea.
Because the spores of *Aspergillus* and *Penicillium* are very similar, they are not differentiated by microscopic analysis and are reported together.

## Aspergillus sp.

Aw 0.75 - 0.82. Reported to be allergenic. Members of this genus are reported to cause ear infections. Many species produce mycotoxins that may be associated with disease in humans and other animals. Toxin production is dependent on the species or a strain within a species and on the food source for the fungus. Some of these toxins have been found to be carcinogenic in animal species. Several toxins are considered potential human carcinogens. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchiospasms; chronic cases may develop pulmonary emphysema; may also be associated with sinusitis, allergic bronchiopulmonary aspergillosis, and other allergic symptoms.

## Basidiospore

Spore from basidiomycetes. Many varieties are reported to be allergenic.

## Bipolaris sp.

A fungus with large spores that could be expected to be deposited in the upper respiratory tract. This fungus can produce the mycotoxin - sterigmatocystin, which has been shown to produce liver and kidney damage when ingested by laboratory animals.

## Botrytis sp.

Aw 0.93. Conidia dimensions: 7-14 x 5-9 microns. It is parasitic on plants and soft fruits. Found in soil and on house plants and vegetables, it is also known as "gray mold". It causes leaf rot on grapes, strawberries, lettuce, etc. It is a well-known allergen, producing asthma type symptoms in greenhouse workers and "wine grower's lung".

## Cercaspora

Common outdoors in agricultural areas, especially during harvest. Parasite of higher plants, causing leaf spot. Commonly found as parasites on higher plants.

## Chaetomium sp.

large ascomycetous fungus producing perithecia. It is found on a variety of substrates containing cellulose, including paper and plant compost. It has been found on paper in sheetrock. It can produce an *Acremonium*-like state on fungal media. Varieties are considered allergenic and have been associated with peritonitis, cutaneous lesions, and system mycosis.

## Cladosporium sp.

Aw 0.88; Aw 0.84. Most commonly identified outdoor fungus. The outdoor numbers are reduced in the winter. The numbers are often high in the summer. Often found indoors in numbers less than outdoor numbers. It is a common allergen. Indoor *Cladosporium* sp. may be different than the species identified outdoors. It is commonly found on the surface of fiberglass duct liners in the interior of supply ducts. A wide variety of plants are food sources for this fungus. It is found on dead plants, woody plants, food, straw, soil, paint, and textiles. Produces greater than 10 antigens. Antigens in commercial extracts are of variable quality and may degrade within weeks of preparation. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include skin lesions, eye ulceration, mycosis (including onychomycosis, an infection of the nails of the feet or hands) edema and bronchiospasms; chronic cases may develop pulmonary emphysema.

## Curvularia sp.

Reported to be allergenic and has been associated with allergic fungal sinusitis. It may cause corneal infections, mycetoma, and infections in immune compromised hosts.

## Dreschlera sp.

Conidia dimensions: 40-120 x 17-28 microns. Found on grasses, grains and decaying food. It can occasionally cause a corneal infection of the eye.

## Epicoccum sp.

Conidia dimensions: 15-25 microns. A common allergen. It is found in plants, soil, grains, textiles and paper products.

## Fusarium sp.

Aw 0.90. A common soil fungus. It is found on a wide range of plants. It is often found in humidifiers. Several species in this genus can produce potent trichothecene toxins. The trichothecene (scirpene) toxin targets the following systems: circulatory, alimentary, skin, and nervous. Produces vomitoxin on grains during unusually damp growing conditions. Symptoms may occur either through ingestion of contaminated grains or possibly inhalation of spores. The genera can produce hemorrhagic syndrome in humans (alimentary toxic aleukia). This is characterized by nausea, vomiting, diarrhea, dermatitis, and extensive internal bleeding. Reported to be allergenic. Frequently involved in eye, skin, and nail infections.

## Myxomycetes

Members of a group of fungi that is included in the category of "slime molds". They're occasionally found indoors, but mainly reside in forested regions on decaying logs, stumps, and dead leaves. Myxomycetes display characteristics of fungi *and* protozoans. In favorable (wet) conditions they exhibit motile, amoeba-like cells, usually bounded only by a plasma membrane, that are variable in size and form. During dry spells, they form a resting body (sclerotium) with dry, airborne spores. These fungi are not known to produce toxins, but can cause hay fever and asthma.

## Memnoniella

Contaminant, found most often with Stachybotrys on wet cellulose. Forms in chains, but it are very similar to Stachybotrys and sometimes is considered to be in the Stachybotrys family. Certain species do produce toxins very similar to the ones produced by Stachybotrys chartarum and many consider the IAQ importance of Memnoniella to be on par with Stachybotrys. Allergenic and infectious properties are not well studied.

## Nigrospora sp.

Commonly found in warm climates, this mold may be responsible for allergic reactions such as hay fever and asthma. It is found on decaying plant material and in the soil. It is not often found indoors.

## Oidium sp.

The asexual phase of *Erysiphe* sp. It is a plant pathogen causing powdery mildews. It is very common on the leaves stems, and flowers of plants. The health effects and allergenicity have not been studied. It does not grow on non-living surfaces such as wood or drywall.

## Penicillium sp.

Aw 0.78 - 0.88. A wide number of organisms have been placed in this genus. Identification to species is difficult. Often found in aerosol samples. Commonly found in soil, food, cellulose and grains. It is also found in paint and compost piles. It may cause hypersensitivity pneumonitis, allergic alveolitis in susceptible individuals. It is reported to be allergenic (skin). It is commonly found in carpet, wallpaper, and in interior fiberglass duct insulation. Some species can produce mycotoxins. Common cause of extrinsic asthma (immediate-type hypersensitivity: type I). Acute symptoms include edema and bronchiospasms; chronic cases may develop pulmonary emphysema. It may also cause headaches, vomiting, and diarrhea.

## Periconia sp.

found in soil, blackened and dead herbaceous stems leaf spots, grasses, rushes, and sedges. Almost always associated with other fungi. Rarely found growing indoors. Reportedly associated with a rare case of mycotic keratitis.

## Pithomyces sp.

A common mold found on dead leaves, plants, soil and especially grasses. Causes facial eczema in ruminants. It exhibits distinctive multi-celled brown conidia. It is not know to be a human allergen or pathogen. It is rarely found indoors, although it can grow on paper.

## Rusts/Smuts

These fungi are associated with plant diseases. In the classification scheme of the fungi, the smuts have much in common with the rusts, and they are frequently discussed together. Both groups produce wind-borne, resistant teliospores that serve as the basis for their classification and their means of spread. Rusts usually attack vegetative regions (i.e., leaves and stems) of plants; smuts usually are associated with the reproductive structures (seeds). They can cause hay fever and asthma.

## Spegazzinia

Spegazzinia species comprise a very small proportion of the fungal biota. This genus is somewhat related to other lobed or ornamented genera such as Candelabrum. No information is available regarding health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) May also be found in air by culturable (Andersen) samples if a long enough incubation period is provided so that sporulation occurs. Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes soil and many kinds of trees and plants.

## Stachybotrys sp.

Aw - 0.94 , optimum Aw ->0.98. Several strains of this fungus (*S. atra, S. chartarum* and *S. alternans* are synonymous) may produce a trichothecene mycotoxin- Satratoxin H - which is poisonous by inhalation. The toxins are present on the fungal spores. This is a slow growing fungus on media. It does not compete well with other rapidly growing fungi. The dark colored fungus grows on building material with high cellulose content and low nitrogen content. Areas with a relative humidity above 55%, and are subject to temperature fluctuations, are ideal for toxin production.
Individuals with chronic exposure to the toxin produced by this fungus reported cold and flu symptoms, sore throats, diarrhea, headaches, fatigue, dermatitis, intermittent local hair loss and generalized malaise. Other symptoms include coughs, rhinitis, nosebleed, a burning sensation in the nasal passages, throat, and lungs, and fever. The toxins produced by this fungus will suppress the immune system affecting the lymphoid tissue and the bone marrow. Animals injected with the toxin from this fungus exhibited the following symptoms: necrosis and hemorrhage within the brain, thymus, spleen, intestine, lung, heart, lymph node, liver, and kidney. Affects by absorption of the toxin in the human lung are known as pneumomycosis.
This organism is rarely found in outdoor samples. It is usually difficult to find in indoor air samples unless it is physically disturbed (or possibly -this is speculation- a drop in the relative humidity). The spores are in a gelatinous mass. Appropriate media for the growth of this organism will have high cellulose content and low nitrogen content. The spores will die readily after release. The dead spores are still allergenic and toxigenic. Percutaneous absorption has caused mild symptoms.

## Stemphylium sp.

Reported to be allergenic. Isolated from dead plants and cellulose materials.

## Torula sp.

Found outdoors in air, soil, on dead vegetation, wood, and grasses. Also found indoors on cellulose materials. Reported to be allergenic and may cause hay fever and asthma.

## Tetraploa

Tetraploa species comprise a very small proportion of the fungal biota. This genus is somewhat related to Triposporium and Diplocladiella. The only reported human infections are two cases of keratitis (1970, 1980) and one case of subcutaneous infection of the knee (1990). No information is available regarding other health effects or toxicity. Allergenicity has not been studied. Usually identified on spore trap samples where it is seen every few weeks. (Spores have very distinctive morphology.) Our laboratory has never found this organism growing on indoor environmental surfaces. Natural habitat includes leaf bases and stems just above the soil on many kinds of plants and trees.

## Ulocladium sp.

Aw 0.89. Isolated from dead plants and cellulose materials. Found on textiles.

## Zygomycetes

Zygomycetes are one of the four major groups of fungi, the others being the Oomycetes, the Ascomycetes, and the Basidiomycetes. Zygomycetes are common, fast growing, and often overgrow and/or inhibit other fungi nearby. Rhizopus and Mucor are two of the most common Zygomycetes seen in the indoor environment. However, others are seen as well, including Syncephalastrum, Circinella, Mortierella, Mycotypha, Cunninghamella, and Choanephora. For further information, please see descriptions of these individual genera.

**The following table lists mycotoxins that are produced by certain types of fungi:**

| Fungi | Mycotoxin |
|---|---|
| Acremonium crotocinigenum | Crotocin |
| Aspergillus favus | Alfatoxin B, cyclopiazonic acid |
| Aspergillus fumigatus | Fumagilin, gliotoxin |
| Aspergillus carneus | Critrinin |
| Aspergillus clavatus | Cytochalasin, patulin |
| Aspergillus Parasiticus | Alfatoxin B |
| Aspergillus nomius | Alfatoxin B |
| Aspergillus niger | Ochratoxin A, malformin, oxalicacid |
| Acremonium crotocinigenum | Crotocin |
| Aspergillus nidulans | Sterigmatocystin |
| Aspergillus ochraceus | Ochratoxin A, penicillic acid |
| Aspergillus versicolor | Sterigmatocystin, 5 ethoxysterigmatocystin |
| Aspergillus ustus | Ausdiol, austamide, austocystin,brevianamide |
| Aspergillus terreus | Citreoviridin |
| Alternaria | Alternariol, altertoxin, altenuene, altenusin, tenuazonic acid |
| Arthrinium | Nitropropionic acid |
| Bioploaris | Cytochalasin, sporidesmin, sterigmatocystin |
| Chaetomium | Chaetoglobosin A,B,C. Sterigmatocystin |
| Cladosporium | Cladosporic acid |
| Clavipes purpurea | Ergotism |
| Cylindrocorpon | Trichothecene |
| Diplodia | Diplodiatoxin |
| Fusarium | Trichothecene, zearalenone |
| Fusarium moniliforme | Fumonisins |
| Emericella nidulans | Sterigmatocystin |
| Gliocladium | Gliotoxin |
| Memnoniella | Griseofulvin , dechlorogriseofulvin, epi-decholorgriseofulvin, trichodermin, trichodermol |
| Myrothecium | Trichothecene |
| Paecilomyces | Patulin, viriditoxin |
| Penicillium aurantiocandidum | Penicillic acid |
| Penicillium aurantiogriseum | Penicillic acid |
| Penicillium brasilanum | Penicillic acid |
| Penicillium brevicompactum | Mycophenolic acid |
| Penicillium camemberti | Cyclopiazonic acid |
| Penicillium carneum | Mycophenolic acid, Roquefortine C |
| Penicillium crateriforme | Rubratoxin |

| | |
|---|---|
| Penicillium citrinum | Citrinin |
| Penicillium commune | Cyclopiazonic acid |
| Penicillium crustosum | Roquefortine C |
| Penicillium chrysogenum | Roquefortine C |
| Penicillium discolor | Chaetoglobosin C |
| Penicillium expansum | Citrinin, Roquefortine C |
| Penicillium griseofulvum | Roquefortine C, cyclopiazonic acid, griseofulvin |
| Penicillium hirsutum | Roquefortine C |
| Penicillium hordei | Roquefortine C |
| Penicillium nordicum | Ochratoxin A |
| Penicillium paneum | Roquefortine C |
| Penicillium palitans | Cyclopiazonic acid |
| Penicillium polonicum | Penicillic acid |
| Penicillum roqueforti | Roquefortine C, Mycophenolic acid |
| Penicillium veridicatum | Penicillic acid |
| Penicillium verrucosum | Citrinin, ochratoxin A |
| Penicillium/ Aspergillus | Patulin |
| Penicillium/ Aspergillus/Alternaria | Glitoxin |
| Phomopsis | Macrocyclic trichothecenes |
| Phoma | Brefeldin, cytochalasin, secalonic acid, tenuazonic acid |
| Pithomyces | Sporidesmin |
| Rhizoctonia | Slaframine |
| Rhizopus | Rhizonin |
| Sclerotinia | Furanocoumarins |
| Stachybotrys chartarum | Iso-satratoxin F, roridin E, L-2, satratoxin G & H, trichodermin, trichodermol, trichothecene |
| Torula | Cytotoxins |
| Trichoderma | Trichodermin, trichodermol, gliotoxin |
| Trichothecium | Trichothecene |
| Wallemia | Walleminol |
| Zygosporium | Cytochalasin |

# General terms

## Allergen

An allergen is a substance that elicits an IgE antibody response and is responsible for producing allergic reactions. Chemicals are released when IgE on certain cells come into contact with an allergen. These chemicals can cause injury to surrounding tissue - the visible signs of an allergy. Only a few fungal allergens have been characterized but all fungi are thought to be potentially allergenic. Fungal allergens are proteins found in either the mycelium or spores

## "Black mold"

The poorly defined term? Black mold? Or? Toxic black mold? Has usually been associated with the mold *Stachybotrys chartarum*. While there are only a few molds that are truly black, there are many that can appear black. Not all molds that appear to be black are *Stachybotrys*.

## Fungi

Fungi are neither animals nor plants and are classified in a kingdom of their own? The Kingdom of Fungi. Fungi include a very large group of organisms, including molds, yeasts, mushrooms and puffballs. There are >100,000 accepted fungal species but current estimates range to 1.5 million species. Mycologists (people who study fungi) have grouped fungi into four large groups according to their method of reproduction.

## Hidden mold

This refers to visible mold growth on building structures that is not easily seen, including the areas above drop ceilings, within a wall cavity (the space between the inner and outer structure of a wall), inside air handlers, or within the ducting of a heating/ventilation system.

## Microbial Volatile Organic Compounds (MVOCs)

Fungi produce chemicals as a result of their metabolism. Some of these chemicals, MVOCs, are responsible for the characteristic moldy, musty, or earthy smell of fungi, whether mushrooms or molds. Some MVOCs are considered offensive or annoying. Specific MVOCs are thought to be characteristic of wood rot and mold growth on building materials. The human nose is very sensitive to mold odors and sometimes more so than current analytical instruments.

## Mold

Molds are a group of organisms that belong to the Kingdom of Fungi (see Fungi). Even though the terms mold and fungi had been commonly referred to interchangeably, all molds are fungi, but not all fungi are molds.

## Mycotoxin

Mycotoxins are compounds produced by some fungi that are toxic to humans or animals. By convention, the term? Mycotoxin? Excludes mushroom toxins. Fungi that produce mycotoxins are called "toxigenic fungi.

## Spore

General Term for a reproductive structure in fungi, bacteria and some plants. In fungi, the spore is the structure which may be used for dissemination and may be resistant to adverse environmental conditions.

## Toxic mold

The term? Toxic mold" has no scientific meaning since the mold itself is not toxic. The metabolic byproducts of some molds may be toxic (see mycotoxin).

## Hypha (plural, hyphae)

An individual fungal thread or filament of connected cells; the thread that represents the individual parts of the fungal body.